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Hyperspectral Pansharpening Based on Guided Filter and Gaussian Filter

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Abstract. Hyperspectral pansharpening aims to integrate the panchromatic (PAN) and hyperspectral (HS) images into a single HS image with high spatial and high spectral resolution. This paper proposes a novel hyperspectral pansharpening method based on guided filter and gaussian filter. Most guided filter based researches extract the spatial details from the PAN image or the single band HS intensity component, and incorrect generation of the intensity component causes the spectral distortion. Different from the traditional guided filter based methods, the structure of the HS image is fully considered by the proposed method. We first use the high frequency layer of each band of the HS image as the guidance image of the guided filter. Then, the total spatial details are extracted from both the PAN image and the HS image. The total spatial details are finally injected into each band of the HS image low frequency layer to generate the fused image. Experiments demonstrate that the proposed method outperforms some state-of-the-art methods in terms of objective quality assessment and subjective visual effect.

Keywords: Hyperspectral image, panchromatic image, image fusion, guided filter.

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1. Introduction

Satellite data with both high spectral and spatial resolution is in demand, since it can provide the accurate description of a certain object. Due to technical limitations [1], current remote sensing systems cannot collect such observations, but can provide hyperspectral (HS) images with high spectral resolution and high spatial resolution panchromatic (PAN) images, simultaneously. Hyperspectral pansharpening is a powerful solution to obtain a single HS image containing the spectral information of the original HS images with enhanced spatial details, which can integrate

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